To discuss fully the precise mode or modes in which the sanitary condition of our present hospitals may be most readily brought to, and kept at, the high standard indicated, would require more space than can be afforded by the limits of this review. Sir James Simpson's original suggestion that the hospitals themselves should be torn down and substituted by "wooden, or brick, or iron villages" may probably be set aside as simply impracticable; even were there space in large cities in which to erect such villages, their proper *administration* (in the technical sense of the word), would be an impossibility. Whether the sought-for panacea is to be found in knocking out the wall on one side of every staircase and corridor; in doing away with corridors altogether and building outside staircases to all the upper wards (both of these plans are suggested by Sir James); in douching all our wounded patients with the spray of carbolic acid and otherwise adopting the minutiæ of what is known as the "antiseptic method;" or in burying our wounded beneath the soil of mother earth, and erecting over them a cerulean canopy of blue paper; whether in any of these plans is to be found a sovereign remedy for the evils of hospitals, and a sure prophylactic against "hospitalism," may be doubted. The subject is too extensive to be entered upon at present, but may perhaps form matter for further discourse upon some future occasion.

J. A., JR.

ART. XVII.—*Lehrbuch der Pathologischen Gewebelehre zur Einführung in das Studium der Pathologischen Anatomie, verfasst* von Dr. EDUARD RINDFLEISCH, Professor der Pathologischen Anatomie in Bonn. Zweite Auflage. 8vo. pp. 633. Leipzig, 1871.

A Text-book of Pathological Histology. An Introduction to the Study of Pathological Anatomy. By Dr. EDWARD RINDFLEISCH, Professor of Pathological Anatomy in Bonn. Translated from the second German edition, with the permission of the author, by W. C. KLOMAN, M.D., assisted by F. C. MILES, M.D., Professor of Anatomy, University of Maryland. 8vo. pp. 695. Philadelphia: Lindsay & Blakiston, 1872.

PATHOLOGICAL ANATOMY is one of the youngest branches of medicine, and may be fairly regarded as having had its starting-point in the work of Morgagni (1761), "On the Seat and Causes of Disease as traced out by Dissection." In the century which has since passed, pathology has made great advances, and this is more markedly the case since microscopic investigation has furnished a more accurate basis for the classification of diseased structures, and has caused pathological histology to assume in relation to morbid anatomy a position much more important than that held by normal histology to anatomy. Its province, as defined by our author in his preface, is to show how such gross changes in organs as enlargements, diminutions, indurations, softenings, discolorations, etc., have their origin in certain changes of their structural elements, and to explain the former by the latter.

The great strides made by science in Germany during the last twenty years, is nowhere more manifest than in this department; and the patient and unwearied investigations, and the beautiful and elaborate monographs published at various times by Virchow, Recklinghausen, Cohnheim, Stricker, Thiersch, Waldeyer, Köster, and others, may well put other countries to the blush when we compare with them the work done, during the same period, either in Europe or in this country. In fact the additions to our knowledge in this direction have of late been so rapid that in this, the second edition of his book, Prof. Rindfleisch has been obliged entirely to rewrite that portion of it devoted to morbid growths. The book differs agreeably from many text-books in being not simply the work of a compiler and bookworm; every chapter bears the stamp of the author's individuality and laborious investigations—here testing the observations of others, there adding some contribution of his own. In a word, as he informs us in his preface, and as the numerous original wood-cuts amply testify, the work has been written rather at the microscope than in the study.

In a few crisp words of "Introduction," Rindfleisch brings us, with almost painful distinctness, face to face with the limits of our histological knowledge, by showing how, when we observe the cells of any living tissue, even with the best optical instruments, we are unable, so long as they are in a state of health, to trace any changes whatever in their appearance; so long as the cell is in a state of formative equilibrium—its accumulation being exactly sufficient to balance its waste—so long it presents to us the same appearance, and we infer nutritive changes only because while certain materials are continually taken up into the system, others are constantly cast out, which prove to be "metamorphic products of vitalized substances."

Any changes which we perceive have two principal directions—formation and degeneration; and in most morbid processes we find these side by side.

It is impossible to criticize justly in the brief space at our disposal a book which is written in so fair and impartial a spirit, and which is, in itself, an epitome of the present state of pathology. The reviewer will, therefore, confine himself to a mention of some of the more noteworthy portions of it, in the hope that every one really interested in pathology will provide himself with a copy, and read it at his leisure.

The book is divided into two parts, general and special.

The first treats of the Decomposition and Degeneration of Tissues and of Pathological New Formation.

The second of Anomalies: I. Of the blood and the places of its formation. II. Of the circulating apparatus. III. Of the serous membranes. IV. Of the skin. V. Of the mucous membranes. VI. Of the lungs. VII. Of the liver. VIII. Of the kidneys. IX. Of the ovaries. X. Of the testicles. XI. Of the breasts. XII. Of the prostate. XIII. Of the salivary glands. XIV. Of the thyroid. XV. Of the suprarenal capsules. XVI. Of the bones. XVII. Of the nervous system. XVIII. Of the muscles.

The first part opens with an account of the decomposition and degeneration of tissues, and takes up the study of necrosis. It shows how, after either general or local death, our tissues fall a prey to the large quantity of water (81 per cent.) contained in them; the albuminates and their derivates are washed out of their containing cells. The blood rapidly changes; its colouring matters leave the corpuscles, and are imbibed by all surrounding tissues, causing the well-known cadaveric discolorations (staining); the red discs become colourless, change their form, and finally disappear. All nucleated cells change rapidly, the protoplasm coagulates and becomes cloudy, and both nucleus and cell break up into relatively large granules, which finally become cloudy and disappear. We are most familiar with this phenomenon in the death of the striated muscles, the so-called rigor mortis. Here, as Kühne and others have shown, the stiffness depends on the separation of a solid albuminous substance (myosin) from the muscular juices, thus forming a whitish but little transparent mass, which causes a marked opalescence, contrasting with the brownish discoloration of other portions. This, however, is but the first step towards death of the muscle, as is instanced by its artificial production in a frog's thigh, when we ligature the supplying artery, but which disappears if the blood supply be restored. If, however, it persist long, the muscle loses its colour and consistence, the transverse striæ and nuclei disappear, numerous dark points, fat globules and pigment granules are seen, the disks disintegrate, and finally, also, the sarcolemma giving way sets free a granular detritus. In some forms of gangrene, however, the muscle breaks up into the Bowman's discs. The non-striated muscular fibres present somewhat similar appearances, as is seen in the so-called softening of the stomach, which was formerly considered as a sign of disease, but is now known to be only a post-mortem change. Bone, as is well known, remains in the necrotic process relatively unchanged; but the fact that sequestra are of less specific gravity than the normal dried bone, shows that it has not only lost its marrow and bloodvessels, but that also a considerable portion of the organic matrix of the bone cartilage is lost by putrefaction. The chemical changes which ensue are manifold, but present us with a number of interesting forms; thus gangrene of the lungs, liver, spleen, etc., often presents us the opaline concentric rounded forms of leucine. Tyrosin shows itself in fine, satiny white needles; margarin in the well-known crystallizations in the fat vesicles, and also in the free oil globules. Occasionally, in alkaline or neutral putrid fluids, we see the coffin-lid-like crystals of the ammonio-magnesian phosphate, further pigment granules and vibriones. The latter our author ranks among the vegetable parasites, and asserts, with Frau Johanna Lüders, that these minute masses of protoplasm escape from the spores of various fungi.

The next section treats of those forms of retrograde metamorphoses which our author calls conditions of involution, viz.: Fatty degeneration, cloudy swelling, mucoid softening, and colloid degeneration. In the first named process we have numerous minute fatty molecules making their appearance in all parts of the cell, within the nucleus and protoplasm; as these become more numerous the cell becomes more spherical in shape, and assumes the appearance of a granular corpuscle. We have the prototype of this process in the formation of milk; here the yellowish granular corpuscles are called colostrum corpuscles, and have their origin in the fatty degeneration of the epithelial gland cells; and in ordinary milk the white appearance is due to the further breaking up of these corpuscles into their component globules. We see the same process in the degeneration of the epithelial cells of soft cancers, where we so frequently, by scraping the cut surface of the tumour with a scalpel, obtain an abundance of a cream-like cancer-juice.

The so-called cheesy degeneration is another form of fatty degeneration, and occurs in those tissues most readily where, either from their position in the body, or from their naturally small supply of blood, there is not present fluid enough to allow of the breaking up and floating off of the fatty molecules and cell detritus. The cells desiccate and shrivel into small angular shapes, and finally we have a yellowish-white friable smeary mass, which was formerly believed to form an essential part of tuberculosis, and was called "crude tubercle."

We must steadily keep in mind that fatty degeneration is something entirely distinct from fatty infiltration; here the fat does not come from without, but is a visible liberation of the fat formerly incorporated in the cell protoplasm. A muscle, therefore, in a state of fatty degeneration, yields no higher percentage of fat than a healthy one. It is simply a rearrangement of the constituents of the cell, and as in all young cells where active growth is going on (*e. g.* in the cells of the yolk in the fecundated ovum) a considerable number of fat molecules are seen in the albuminous protoplasm of the cells—fat which entirely disappears in the formed tissue; so here, in its retrograde metamorphosis, we see it once more given up and becoming visible.

In both mucoid and colloid degenerations we have a diaphanous, trembling, jelly-like substance, penetrated by net-like fibres, which consist in the first case of stellated anastomosing cells; in the second, of the remains of the fibrillar intercellular substance. The first contains mucin, and is, in all respects, constituted like the fœtal subcutaneous connective tissue, and the Whartonian jelly of the umbilical cord. The second contains a substance not precipitated, like mucin, by acetic acid, and the microscope shows the presence of a highly refracting, fat-like body, the so-called colloid globule in the cells of the part.

The interferences with nutrition caused respectively by the amyloid, calcareous, pigmentary and fatty infiltrations are next considered. When we examine a portion of amyloid infiltrated tissue, we find that the cells look swollen, that their sharp angles and edges have been rounded, and that they have a homogeneous, translucent, and slightly opaline appearance. In the spleen, kidney, liver, and other organs usually affected by this change, we invariably find that its first traces are to be seen in the smaller arteries and capillary vessels. In the arteries the infiltration first attacks the inner, then the middle coat, and finally the adventitia and the adjacent tissue. This diminution of the calibre of the vessels causes the anæmic state of such tissues, while the infiltration of the cells produces the well-known grayish translucent appearance. The infiltrated tissue loses its elasticity, becomes doughy, and pits on pressure. As is well known, the addition of iodine causes the infiltrated parts to turn mahogany-red, and thus furnishes a valuable test for the slighter degrees of the affection. In treating of calcification, our author defends the view that the solubility of the lime-salts in the blood and tissues is due to an excess of carbonic acid, and careful observation shows that the first deposits of these salts, both in physiological and pathological processes, occur at the extreme boundaries of some given vascular zone. The lime is there deposited because its solvent, the free carbonic acid, has, by its greater capacity for diffusion, left the stagnating blood and been excreted in other ways, leaving the insoluble lime-salts behind.

True, pigmentation (not owing to some dyscrasia) is usually associated with some local hyperæmia or extravasation of blood, and is due to the escaped and degenerated hæmoglobin. This changes into hæmatoidin, which is often met with in its crystalline form, but afterwards breaks down into dark brown, or black granules, which are taken up by the protoplasm of cells, leaving their nuclei free, and thus reversing the action of many of our staining solutions, *e. g.* carmine. The pigment infiltration does not seem materially to diminish the functional capacity of the cell. Thus we all know the facility that the cells of the choroid and those of the negro's skin have for keeping themselves supplied from the colouring matter of the blood, and the pigmented sarcomas exhibit no diminution of their malignancy, even when thoroughly infiltrated with black or brown pigment.

The fatty infiltration is so familiar to all, as it occurs in the liver and subcutaneous cellular tissue, that a detailed description of it is superfluous. It distinguishes itself from fatty degeneration in the fact that although both commence as small globules in the interior of the cell protoplasm, in fatty infiltration these coalesce into large drops, and force the nucleus to one side, while in fatty metamorphosis, although they may steadily increase, they never become confluent.

Pathological New Formation.—After a few general remarks on cell structure, origin, and growth, and a series of definitions of the terms he subsequently uses in the work, our author gives an interesting section on "normal growth as a type of pathological," and commences the consideration of pathological new growths by taking up the subject of inflammation. Realizing that the whole theory of inflammation has recently undergone a revolution, and that it is really one of the most knotty and difficult, as well as one of the most important subjects in pathology, our author is very circumspect and guarded in the opinions which he enunciates regarding it. While accepting, without reservation, the discoveries of Cohnheim, so far as relates to the migration of the white corpuscles out of the vessels, he hesitates to accept them as the only source of new growth, quoting the investigations of Stricker to prove that the cells of inflamed tissue themselves undergo changes in inflammation "which can only be interpreted in the sense of progressive metamorphosis," and also, the further observation of Stricker, that the wandering cells in inflammatory depots multiply by fission. Moreover, in his chapter on the inflammation of mucous membranes, he refers to the observations of Remak and Buhl, confirmed by his own experience, which prove that in such inflammations there is frequently an endogenous formation of cells by the cells of their lining epithelium. In treating of the healing of wounds by granulation, he shows that the wound does not skin over by outgrowth of the neighbouring epithelium, but that, influenced by a certain epithelial infection, the cells nearest the remaining epithelium gradually take on an epithelial character, and adds: "If we seek for an analogue of this epithelial formation, we can only compare it to that primal separation of the embryonal germinal tissue into epithelial and non-epithelial layers, and regard it as a genuine embryonal differentiation."

Under the head of Specific Inflammation, Rindfleisch treats of those new growths which are classified by Virchow in his work on "Morbid Tumours" as granulation and lymphatic tumours.

These are to be distinguished from ordinary inflammation in that, in place of or in addition to the ordinary plastic exudation, they yield certain products, which are characterized by special anatomical peculiarities. The latter are typical for each individual process, and are in general traceable to the particular quality of the inflammatory irritant. As such, in every case, a specific virus is active, which either passes into the organism by hereditary transmission, or is acquired by contagion, or finally primarily formed in the organism. Under this head syphilis, lepra, glanders, typhus, and tubercle, are specially treated of.

Constitutional syphilis gives a tendency to active hyperæmia and inflammatory new formations. The so-called gumma syphiliticum is due to the formation of a circumscribed globular swelling within a larger depot of germinal tissue. The so-formed node differentiates itself by marked metamorphosis, and while the bulk of the germinal tissue goes into the formation of a dense cicatrix with unusual retractile power, the cells within the gumma retain a rounded form, and by their anastomoses form a cellular net, the basis substance undergoing a mucoid degeneration. The cells themselves undergo fatty degeneration, and thus become transformed to rounded aggregations of fat granules. Thus is formed the characteristic gummy tumour—an elastic yellowish-white rounded mass, imbedded in a depot of newly-formed connective tissue.

Typhus.—We have the acme of typhus changes in the well-known changes of the Peyer's patches in enteric fever. The cells differ from those of ordinary acute inflammation in that they have a more epithelial appearance, and while, in the ordinary lymph corpuscle, the protoplasm scarcely equals the space occupied by the nucleus, in the "typhus cell" the protoplasm occupies usually more space than the nucleus, thus approaching a low grade of epithelial development.

Tubercle —The modern definition of tubercle excludes all that cheesy degeneration which was formerly tubercle *par excellence.* We now restrict the term to the grayish, translucent, compact and miliary nodules which are so frequently associated with the cheesy inflammation. According to Villemin, Klebs and Cohnheim, the introduction of this cheesy detritus into an individual results in the occurrence of "miliary tuberculosis," whether this result be obtained by inoculation or the formation of the cheesy detritus within the individual himself. If we tease to pieces, with fine needles, one of the miliary granules, we obtain large cells of a rounded angular form, consisting of a finely granulated, highly refracting substance. These have a moderate sized, usually eccentrically situated nucleus, shining and darkly contoured—sometimes single and sometimes multiple. We encounter also smaller cells, in every way similar to the nuclei of the larger ones, which have probably been formed by endogenous development. These are all imbedded in a finely fibrous network. Experience proves that such tubercles arise usually in the outer coat of the small arteries and transition vessels. "They are placed as lateral projections, single or united in small groups upon the larger branches, while upon the more minute branches and the 'almost capillary vessels' they present themselves as spindle-shaped varicosities, which occupy the whole circumference of the vessel." This is often admirably seen in the small cerebal vessels where His has demonstrated that the tubercles arise from the endothelia of the lymph vessels which here surround and form a sheath for the bloodvessels. The presence of a bloodvessel is, however, not a necessary condition for their origin; they may arise anywhere where we find an endothelium—from the endothelia of serous membranes, of lymph vessels, of bloodvessels—in short, wherever endothelial cells are subject to a specific irritation.

Histoid Tumours, according to our author, include the sarcomata, and the cavernous, fatty, cartilaginous, mucoid, bony, muscular, and nerve tumours, and are distinguished by the interior continuity of their elementary parts. "The majority of them consist only of one tissue; when, however, more tissues participate in their composition, they are never found in a differential apposition with sharply drawn limits, as epithelium and connective tissue, but pass organically into each other." They all have for their starting-point embryonal connective tissue. This group includes tumours which are clinically of the most dissimilar nature—some types of benign growths, *e. g.* lipomata, others of malignant ones, *e. g.* the small round-celled sarcomata. Where such new formations grow only by a continuous proliferation of their own cells, they often after they have attained a certain degree of development are enveloped by a fibrous capsule which completely separates them from the surrounding tissues, and we constantly meet fatty, cartilaginous, and fibrous tumours thus isolated. Where the growth is a peripheral one, the tumour increasing constantly at the expense of the surrounding connective tissue, as in the sarcomata, we have to deal with a much more aggressive and dangerous form of nutritive disturbance.

The sarcomata present types of tissue such as are constantly met with in inflammatory hyperplasia, viz., the round-celled formative tissue of granulations, the spindle-cell tissue, and the compact fibrous tissue of cicatrices, and we accordingly distinguish in them three principal branches, namely, the round-celled sarcoma, the spindle-celled sarcoma, and the fibroma. Some varieties of sarcoma are among the most malignant tumors with which we are acquainted, and Rindfleisch here enters into a discussion as to the malignity of new formations and sums up the arguments of those who believe that the development of every malignant tumour is preceded by a constitutional dyscrasia as well as of those who advocate a primary local origin, and is evidently inclined to range himself with the latter party, although he is not disposed "to anticipate in any way the coming decision of this question." As a general rule it may be stated that those growths are the most malignant which take their origin in tissue where there is a large vascular supply, and that those varieties which contain many small, young, mobile cells, recur more frequently and more promptly than those containing spindle-shaped or myeloid cells.

Carcinomata.—The term cancer, which was formerly applied to all malignant growths, is now restricted to those which are essentially epithelial in their type. They consist of an alveolar fibrous stroma in which are packed cells of an epithelial type without any intra-cellular substance. "By far the greater number of carcinomas proceed primarily from the epithelial clad surfaces of the body, from the skin and mucous membrane, or from the secreting glands. They depend upon an abnormal growth of epithelial tissue. We have, therefore, a variety of processes from simple hypertrophy of a gland to well-marked cancer, and modern pathologists have invented the term adenoma to designate a form of tumour which stands between the two.

The greatest diversity of opinion reigns as to the manner in which normal epithelium is reproduced and grows, and the question is even more hotly contested as regards the pathological formations of an epithelial type. Thirsch, Waldeyer, Köster, and others have recently published able monographs on the subject, but much remains yet to be accomplished.

Rindfleisch divides the carcinomas into I. Glandular cancer; II. Epithelial cancer (epithelioma). The first may be either hard (scirrhous) or soft (medullary), according to the greater or less abundance of the connective tissue stroma, and according to greater or less size of the contained alveoli, and in certain situations (*e. g.* stomach, large intestine, liver, etc.) we sometimes find the cells undergoing the colloid degeneration. In the glandular variety we are told "that the new formation has its starting-point in the glandular epithelium has of late been established by numerous investigations." The cells multiply by division. First of all, probably, the lumen of the tubuli and acini fills up and in their place we have solid cell groups, which, however, immediately push out outgrowths in all directions, and by means of these penetrate into the surrounding connective tissue. Under the head of epithelial cancer our author recapitulates the results of some of the more recent investigations on the subject and says, "According to Thirsch, Billroth, and others, the epithelial shoots grow exclusively by the division of the epithelial cells contained in them ; according to Köster, the growth is by apposition and ensues by a corresponding metamorphosis of the endothelia of the lymph-vessels in whose cavities the epithelial projections exclusively extend themselves and advance. I for my part can neither overlook the very evident fact that lively nuclear and cellular divisions take place in the epithelial shoots, nor ignore the speaking pictures which we obtain if we, according to Köster's direction, cut parallel to the surface and examine the indurated edge of certain flat epithelial cancers of the cutis."

In the second or special part of the work, Rindfleisch takes up in succession the various subjects whose headings have been enumerated in the first pages of this notice. In the chapter on the blood, we have an able description of the minute structure of thrombi ; of the methods in which they originate in the vessels and subsequently soften or become organized, and also of the embolic processes.

In the chapter on serous membranes our author states, that these structures are not organs, but part of that system of clefts or fissures in the body, which, since the investigations of Recklinghausen, have been universally regarded as forming a part of the lymphatic system. The epithelium covering their surface consists of thin transparent polygonal scales, and attached to it on the under side a nucleus with barely enough protoplasm to hold it in position. He maintains that in inflammation these cells proliferate and subdivide, and that from them the primary heteroplastic growths (sarcoma, tubercle, cancer) in these membranes originate.

At the commencement of the chapter on the anomalies of the mucous membranes, our author recapitulates in a few words their peculiarities of structure and function and calling attention to the thinning of the epithelial layer by the loss of its horny stratum as we pass at any of the orifices of the body from skin to mucous membrane, thus continues, "No doubt can reasonably exist as to the significance of this decrease of the thickness of the epithelium in the anterooms (atria) of the digestive tract. It is the first step towards facilitating the osmotic interchange between the fluids and gases in the lumen of the tract upon the one side and the blood upon the other. Where this exchange, as resorption or secretion, becomes more active, where it forms the foundation of the entire nutrition, the last layer of pavement epithelium also disappears and the cylindrical cells alone remain. Thus the intestinal canal from the cardia to the anus, thus the respiratory passages, thus the female sexual organs from the external orifice of the uterus, are all clothed with a cylindrical epithelium." "The greater part of all the diseased conditions of man are either catarrhs of mucous membranes or are complicated with them." Then follows a full discussion of catarrh, and he divides all other inflammations of mucous membranes into croupous and diphtheritic. In the former we have a fibrinous exudation on the surface, which, when removed, shows the mucous membrane remaining intact; in the latter the exudation takes place in the substance of the tissue itself, and the apparent false membrane is really a slough of the whole thickness of the membrane, leaving a raw surface beneath. In pneumonia we have a type of the first; in dysentery of the second. It will be seen at a glance, that according to this definition, diphtheritis is something very different from what is usually understood in clinical treatises as diphtheritic inflammation in the throat and chest.

We hope that the foregoing *résumé* and extracts will have been sufficient to give the reader a fair idea of the book, and that it may have interested him sufficiently to induce him to carefully study it. In conclusion, we cordially recommend it as the best treatise on the subject; a treatise which, if studied in conjunction with either Förster's *Handbook of Pathological Anatomy* or Klebs's work of the same title, cannot fail to give the reader a clear and comprehensive insight into pathology.

As regards the American translation we have only to add, that while it does credit to the gentlemen whose names stand upon its title-page as a most conscientious rendering of the original, it is disfigured by arrant "Germanisms" at almost every page, and we hope that should another edition be called for they will exert themselves to render it into more vigorous and idiomatic English. W. F. N.